Radiochemical Processing Laboratory
2007
Technical Safety Requirements
Revision 0

Prepared for the U.S. Department of Energy
Under Contract DE-AC06-76RLO 1830

(Blank Page)

Radiochemical Processing Laboratory

Technical Safety Requirements

This is a **controlled document**. Hardcopy distribution is maintained by Document Control in accordance with verified distribution document requirements. Controlled hardcopies should be returned to Document Control, K3-70, when no longer needed.

The current version of this document is also maintained on the RPL Operating Envelope Web site.

Only a controlled or workplace copy per PAP-70-601, or current version from the RPL web site, shall be used for determining compliance

Responsible Staff Member:

AR Stithem, Safety Basis Engineer
Facility Safety

Responsible Organization:

FG Buck, RPL Building Manager
Facilities Operations

Approval:

LO Casazza, Nuclear Operations Director
Facilities and Operations

Battelle
Pacific Northwest National Laboratory
Richland, Washington, 99352

(Blank Page)

Summary

The Radiochemical Processing Laboratory (RPL) is a Pacific Northwest National Laboratory (PNNL) research and development facility located in the 300 Area of the Hanford Site, Richland, Washington. The RPL has been designated a DOE hazard category 2 nonreactor nuclear facility based on allowable inventories of radioactive and fissionable materials. Laboratory operations and activities in the RPL involve research and development in radiochemical process science and engineering; evaluation, analysis, and testing of radioactive, radiochemical, chemical, and physical material properties; development and experimentation in the design and application of radiation generating devices; and the development and conduct of analytical procedures in support of research activities.

Technical Safety Requirements (TSRs) are the DOE-approved limits, controls, and related actions that establish the specific parameters and requisite actions for the safe operation of a nuclear facility and include, as appropriate for the work and hazards identified in the RPL documented safety analysis, SAFETY LIMITS, OPERATING LIMITS, SURVEILLANCE REQUIREMENTS, ADMINISTRATIVE and MANAGEMENT CONTROLS. Included in this document are the use and application instructions, and their basis.

The TSRs contained in this document were developed from Radiochemical Processing Laboratory Documented Safety Analysis, PNNL-DSA-RPL. Compliance with the TSRs is a regulatory requirement associated with the operation of the RPL.

Section 1, Use and Application, contains basic information and instructions for using and applying the TSRs. Important terms are presented in UPPER-CASE type in the TSRs and are defined in Section 1.1. Section 1 also contains OPERATIONAL MODES, frequency notations, acronyms, and a description of the purpose and scope of the TSRs.

Section 2, Safety Limits, presents the SAFETY LIMITS. SAFETY LIMITS (SLs) are limits on process variables associated with those safety class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive materials. SLs are limits that, if exceeded, could directly cause the failure of one or more of the physical barriers that prevent the uncontrolled release of radioactive materials. (Note: There are no safety class physical barriers that must be controlled to maintain facility operations within the analyses presented in the DSA. Therefore, there are no RPL SLs.)

Section 3/4, Operating Limits and Surveillance Requirements, contains the LIMITING CONTROL SETTINGS (LCSs), the LIMITING CONDITIONS FOR OPERATIONS (LCOs), and their associated SURVEILLANCE REQUIREMENTS (SRs). LCSs function to prevent exceeding SLs. (Note: There are no SLs for operation of the RPL, therefore there are no LCSs.) LCOs establish the lowest permitted functional levels of facility hardware. For application at the RPL, LCOs are also used to establish radioactive material inventory limits.

Section 5, Administrative Controls, imposes administrative requirements. The ADMINISTRATIVE CONTROLS (ACs) are the provisions relating to organization and management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of the RPL.

Appendix A provides a summary of bases for the SLs, LCSs, LCOs, and the associated SRs. Included are the bases for the programmatic ADMINISTRATIVE CONTROLS.

Contents

Summary i

Section 1 Use and Application

1.0 USE AND APPLICATION 1-3
- 1.1 DEFINITIONS 1-3
- 1.2 OPERATIONAL MODES 1-6
  - 1.2.1 NORMAL OPERATIONS MODE 1-6
  - 1.2.2 STANDBY MODE 1-6
  - 1.2.3 MODE CHANGES 1-6
- 1.3 FREQUENCY NOTATIONS 1-7
- 1.4 ACRONYMS 1-7
- 1.5 PURPOSE AND APPLICATION OF THE TSRs 1-8
  - 1.5.1 SAFETY LIMITS 1-8
  - 1.5.2 LIMITING CONTROL SETTINGS 1-8
  - 1.5.3 LIMITING CONDITIONS FOR OPERATION 1-9
  - 1.5.4 SURVEILLANCE REQUIREMENTS 1-9
- 1.6 ALTERNATE EMERGENCY ACTIONS 1-10
- 1.7 TSR VIOLATION 1-10
- 1.8 GENERAL PRINCIPLES OF OPERABILITY 1-10
- 1.9 REFERENCES 1-11

Section 2 Safety Limits

2.0 SAFETY LIMITS 2-3

Section 3/4 Operating Limits and Surveillance Requirements

3/4.0 GENERAL APPLICATION 3/4-3
- 3.0.1 LIMITING CONTROL SETTINGS 3/4-3
- 3.0.2 LIMITING CONDITIONS FOR OPERATION 3/4-3
- 4.0.1 SURVEILLANCE REQUIREMENTS 3/4-4

3/4.1 (Reserved for future use) 3/4-5

3/4.2 RADIOACTIVE MATERIAL 3/4-6
- 3.2.1 IN-PROCESS ROOM LIMIT 3/4-6
- 4.2.1 IN-PROCESS ROOM LIMIT RADIOACTIVE MATERIAL TRACKING 3/4-6
- 3.2.2 IN-PROCESS AREA LIMIT 3/4-7
- 4.2.2 IN-PROCESS AREA LIMIT RADIOACTIVE MATERIAL TRACKING 3/4-7
- 3.2.3 IN-PROCESS FACILITY LIMIT 3/4-8
- 4.2.3 NONE 3/4-8
- 3.2.4 OUTDOOR CONTAINER LIMIT 3/4-9
- 4.2.4 OUTDOOR CONTAINER LIMIT 3/4-9
- 3.2.5 EAST STORAGE YARD LIMIT 3/4-10
- 4.2.5 EAST STORAGE YARD LIMIT 3/4-10
- 3.2.6 OUTDOOR TRANSFER LIMIT 3/4-11
- 4.2.6 OUTDOOR TRANSFER LIMIT 3/4-11

3/4.3 FIRE SUPPRESSION 3/4-13
3.3.1 FIRE SUPPRESSION SYSTEMS 3/4-13
4.3.1 FIRE SUPPRESSION SYSTEM INSPECTION 3/4-13

Section 5 Administrative Controls
5.1 CONTRACTOR ORGANIZATION AND RESPONSIBILITY 5-3
5.2 PROCEDURES 5-3
5.3 PROGRAMS 5-4
5.3.1 RADIOACTIVE MATERIAL EVALUATION PROGRAM 5-4
5.3.2 RADIATION PROTECTION PROGRAM 5-4
5.3.3 FIRE PROTECTION PROGRAM 5-4
5.3.4 NUCLEAR CRITICALITY SAFETY PROGRAM 5-5
5.3.5 WORKER SAFETY PROGRAM 5-5
5.4 OPERATING SUPPORT 5-5
5.5 FACILITY STAFF QUALIFICATIONS AND TRAINING 5-5
5.6 TECHNICAL SAFETY REQUIREMENT BASIS CONTROL 5-5
5.7 REVIEWS AND AUDITS 5-6
5.8 REPORTING REQUIREMENTS 5-6

Appendices

Appendix A TSR Bases
A-1.0 TSR BASES A-3
A-2.0 BASIS SUMMARY A-3
A-3.0 BASIS A-3
A-3.1 (Reserved for future use) A-3
A-3.2/4.2 Basis for Radioactive Material Limits A-6
A-3.2.1 Basis for Radioactive Material IN-PROCESS ROOM Limit A-6
A-4.2.1 Basis for Radioactive Material IN-PROCESS ROOM Limit Surveillance A-6
A-3.2.2 Basis for Radioactive Material IN-PROCESS AREA Limit A-6
A-4.2.2 Basis for Radioactive Material IN-PROCESS AREA Limit Surveillance A-7
A-4.2.3 Basis for Radioactive Material IN-PROCESS Facility Limit A-7
A-3.2.4 Basis for OUTDOOR CONTAINER Limit A-7
A-4.2.4 Basis for OUTDOOR CONTAINER Limit Surveillance A-8
A-3.2.5 Basis for EAST STORAGE YARD Limit A-8
A-4.2.5 Basis for EAST STORAGE YARD Limit Surveillance A-8
A-3.2.6 Basis for OUTDOOR TRANSFER Limit A-8
A-4.2.6 Basis for OUTDOOR TRANSFER Limit Surveillance A-9
A-3.3 Basis for Fire Suppression System A-9
A-4.3 Basis for Fire Suppression System Surveillance A-10
A-AC Bases for Programmatic Administrative Controls A-10

Document Revision History
Revision History ..... RH Page 2

Tables

1.3-1 Frequency Notations 1-7
1.5-1 Rules for Application of Safety Limits 1-8
1.5-2 Rules for Application of Limiting Control Settings 1-8
1.5-3 Rules for Application of Limiting Conditions for Operation 1-9
1.5-4 Rules for Application of Surveillance Requirements 1-9
1.7-1 Definition of TSR Violation 1-10
A-1 TSRs Derived from Accident Analyses for RPL Operations (Internal) A-4

Section 1 Use and Application

(Blank Page)

1.0 USE AND APPLICATION

This section contains basic information and instructions for using and applying the TSRs.

1.1 DEFINITIONS

NOTE: Defined terms in this list appear in upper-case type throughout the TSRs.

Term	Definition
ACTION	ACTIONS shall be that part of a SAFETY LIMIT (SL), LIMITING CONTROL SETTING (LCS), or LIMITING CONDITION for OPERATION (LCO) that prescribes required actions to be taken under designated conditions within specified completion times.
AREA	Specified region within the RPL made up of one or more "blocks." The RPL consists of five (5) "areas." • First-floor laboratories that are south of the northern most East-West corridor • First-floor laboratories that are north of the northern most East-West corridor • 325 A (HLRF) • 325 B (SAL) • Basement.
ADMINISTRATIVE CONTROLS (ACs)	Provisions relating to organization and management, procedures, record-keeping, assessment, and reporting necessary to ensure safe operation of the facility.
DOUBLE-CONTINGENCY PRINCIPLE	Process designs shall incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible, i.e., no single occurrence can result in a criticality.
EAST STORAGE YARD	The East Storage Yard is a fenced enclosure adjacent to the RPL on the east side of the building and is designated as an outdoor Radioactive Material Area (RMA).
FISSIONABLE MATERIAL	Radionuclides capable of sustaining a neutron chain reaction. Natural uranium, depleted uranium, and thorium are not considered to be fissionable materials for the purpose of maintaining a criticality safety program.
H-3E	Curies of tritium equivalent. Used as an inventory measurement tool to represent radioactive materials in gaseous form. For a given radionuclide, one Ci H-3E represents the number of Ci of that given radionuclide that would produce the same effective dose equivalent, as would one Ci of tritium.

IMMEDIATELY	When the term IMMEDIATELY is used as a special completion time, the required ACTION is to be commenced without delay, and continuously pursued in a controlled manner until complete. The use of IMMEDIATELY implies the highest sense of urgency.
IN-PROCESS	In-process radioactive material is the accountable material within a designated space, other than facility holdup, that cannot be exempted due to its form or storage in an approved or qualified container from that designated space's accountable radioactive material inventory.
IN-TRANSIT	In-transit radioactive material is RPL accountable material, that cannot be exempted due to its form or container, which is actively being transferred around the outside of the RPL Building. "Actively being transferred" implies the material is attended.
LIMITING CONDITIONS FOR OPERATION (LCOs)	The lowest functional capability or performance levels of safety structures, systems and components required for safe operations. For application at the RPL, LCOs are also used to establish maximum permitted radioactive material inventory levels.
LIMITING CONTROL SETTINGS (LCSs)	Settings on safety systems that control process variables to prevent exceeding the SAFETY LIMITS. (Note: There are no SLs for operation of the RPL, therefore, there are no LCSs.)
NORMAL OPERATIONS	(See Section 1.2, Operational Modes.)
OPERABLE/ OPERABILITY	A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and operating parameters necessary for OPERABILITY are within limits, and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication, or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s). (See Section 1.8, General Principles of Operability.) In the application of the LCO requirements and the SRs for radioactive material inventories, the term "within the Room/Area/Facility Limit" is analogous to the term "OPERABLE" used in hardware-related TSRs. Concurrently, the term "exceeds the Room/Area/Facility Limit" is analogous to the term "inoperable" used in hardware-related TSRs. The designation of a ROOM, AREA or FACILITY being inoperable denotes that the only activities that can be performed with the IN-PROCESS inventory are those associated with STANDBY (See Section 1.2 Operational Modes).

OPERATING LIMITS	Those limits required to ensure the safe operation of the RPL, including LIMITING CONTROL SETTINGS and LIMITING CONDITIONS FOR OPERATION.
OPERATIONAL MODES	OPERATIONAL MODES for RPL are NORMAL OPERATIONS AND STANDBY. (See Section 1.2, Operational Modes.)
Pu-239E	Curies of plutonium-239 equivalent. Used as an inventory measurement tool to represent radioactive materials in solid, liquid, or particulate form. For a given radionuclide, one Ci Pu-239E represents the number of Ci of that given radionuclide that would produce the same effective dose equivalent, as would one Ci of Pu-239.
RADIOLOGICAL FACILITY STATUS	(See Section 1.2, Operational Modes.)
ROOM	Specified region within the RPL defined as an area enclosed by a single set of walls, ceilings, and floors without significant openings to adjoining locations. General Room designations in the RPL are: • each enclosed basement area • each first-floor laboratory • each hot cell gallery • the entire set of Shielded Analytical Laboratory hot cells • each hot cell of the High-Level Radiochemistry Facility
SAFETY BASIS	The documented safety analysis and hazard controls that provide reasonable assurance that the RPL can be operated safely in a manner that adequately protects workers, the public, and the environment.
SAFETY LIMITS (SLs)	Limits on process variables associated with those safety class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive and other hazardous materials. (Note: There are no process variables that must be controlled to maintain facility operations within the analyses presented in the DSA. Thus, no SLs are required for the RPL.)
STANDBY	(See Section 1.2, Operational Modes.)
SURVEILLANCE REQUIREMENTS (SRs)	Requirements related to testing, calibration, or inspection to ensure OPERABILITY of safety structure, systems, and components and their support systems, or to ensure that operations are within the specified LCO.
VIOLATION	(See Section 1.7, TSR Violation.)

1.2 OPERATIONAL MODES

The operational modes that apply to the RPL are defined as follows.

1.2.1 NORMAL OPERATIONS MODE

The mission of the facility is being performed. Work with or handling of radioactive materials is or may be in progress.

1.2.2 STANDBY MODE

In this mode, work with IN-PROCESS radioactive material is restricted in order to: 1) reduce the potential for an operational accident occurring, including reducing the material inventory; and/or 2) put IN-PROCESS radioactive material into a safe configuration to reduce consequences should an accident occur.

1.2.3 MODE CHANGES

Internal to the RPL: To move from STANDBY to NORMAL OPERATIONS mode, the OPERABLE condition requirements of LCO-3.2.1, LCO-3.2.2, and LCO-3.2.3 must be satisfied.

- LCO-3.2.1 Radioactive material inventory within IN-PROCESS ROOM Limit.
- LCO-3.2.2 Radioactive material inventory within IN-PROCESS AREA Limit.
- LCO-3.2.3 Radioactive material inventory within IN-PROCESS Facility Limit.

External to the RPL: To move from STANDBY to NORMAL OPERATIONS mode, the applicable OPERABLE condition requirements of LCO-3.2.4, LCO-3.2.5 and LCO-3.2.6 must be satisfied.

- LCO-3.2.4 Radioactive material inventory within OUTDOOR CONTAINER Limit
- LCO-3.2.5 Radioactive material inventory within EAST STORAGE YARD Limit
- LCO-3.2.6 Radioactive material inventory within OUTDOOR TRANSFER Limit

1.3 FREQUENCY NOTATIONS

The frequency notations, as used in the TSRs, are defined in Table 1.3-1. Each SURVEILLANCE REQUIREMENT shall be performed within the specified intervals. The extensions are intended to provide operational flexibility and should not be relied upon routinely.

TABLE 1.3-1
Frequency Notations

Frequency Notation and Standard Interval	Interval Between Two Consecutive Surveillances Not to Exceed[(a)]
WEEKLY - at least once every 7 days	9 days
MONTHLY - at least once every 31 days	39 days
QUARTERLY - at least once every 92 days	115 days
SEMI-ANNUALLY - at least once every 184 days	230 days
ANNUALLY - at least once every 12 months	15 months
(a) 1.25 times the standard interval.	

1.4 ACRONYMS

AC	ADMINISTRATIVE CONTROL	LCS	LIMITING CONTROL SETTING
ANSI	American National Standards Institute	PNNL	Pacific Northwest National Laboratory
CAS	Criticality Alarm System	REVS	Radioactive Exhaust Ventilation System
DOE	U.S. Department of Energy	RL	DOE Richland Operations Office
DSA	Documented Safety Analysis	RMA	Radioactive Material Area
ESH&Q	Environment, Safety, Health & Quality	RPL	Radiochemical Processing Laboratory
HEPA	High Efficiency Particulate Air	SAL	Shielded Analytical Laboratory
HLRF	High-Level Radiochemistry Facility	SBMS	Standards Based Management System
HQ	DOE Headquarters Office	SL	SAFETY LIMIT
IOPs	Integrated Operations System	SR	SURVEILLANCE REQUIREMENT
LCO	LIMITING CONDITION FOR OPERATION	TSR	Technical Safety Requirement
		USQ	Unreviewed Safety Question

1.5 PURPOSE AND APPLICATION OF THE TSRs

1.5.1 SAFETY LIMITS

SLs are process variables indicative of barrier failure that could lead to uncontrolled releases of radioactive materials. Application of SLs is to the following rules in Table 1.5-1. (Note: There are no process variables that must be controlled to maintain facility operations within the analyses presented in the DSA. Thus, no SLs are required for the RPL.)

TABLE 1.5-1
Rules for Application of Safety Limits

Compliance with SLs is required in all modes. Exceeding a SL is a TSR VIOLATION (see Table 1.7-1).
Upon exceeding a SL, the following steps are to be taken: The affected parameter must be immediately brought within the SL; The TSR is to specify ACTIONS to be taken which must place the involved process in the most stable, safe condition attainable, including shutdown; All other ACTION statements must be met.
A technical evaluation of the SL VIOLATION is required to determine if any damage may have occurred and to evaluate the capacity of the system(s) to restart.
After VIOLATION of a SL, restart of the affected system(s)/component(s) is prohibited until DOE approval is received.

1.5.2 LIMITING CONTROL SETTINGS

LCSs are process variable parameters for safety systems that function to prevent exceeding SLs. Application of LCSs is to the following rules in Table 1.5-2. (Note: There are no SLs for operation of the RPL, therefore there are no LCSs.)

TABLE 1.5-2
Rules for Application of Limiting Control Settings

Compliance with a LCS is required in the modes specified.
Upon discovery that the instrumentation or interlock set point is less conservative than the required LCS, the associated ACTION statement must be met.
Failure to comply with an ACTION statement following exceeding a LCS is considered a TSR VIOLATION (see Table 1.7-1). (Note: Failure to meet a LCS does not result in TSR VIOLATION when all applicable ACTION statements are completed as specified.)
Restoration of the LCS prior to the expiration of the specified time interval of the ACTION statement removes the requirement to complete the ACTION statement.
If an automatic safety system does not function as required, appropriate ACTION should be taken to compensate. Such ACTION may be manual process shutdown or adjustment.

1.5.3 LIMITING CONDITIONS FOR OPERATION

LCOs establish the lowest functional capability of performance levels of safety structure, systems, and components required for normal safe operation of the facility. At the RPL, LCOs are also used to establish maximum permitted radioactive material inventory levels. Application of LCOs is to the following rules in Table 1.5-3.

TABLE 1.5-3
Rules for Application of Limiting Conditions for Operation

Compliance with an LCO is required in the modes specified.
Upon the failure to meet an LCO, the associated ACTION statement must be met.
Failure to comply with an ACTION statement following failure to meet an LCO is considered a TSR VIOLATION (see Table 1.7-1). (Note: Failure to meet an LCO does not result in TSR VIOLATION when all applicable ACTION statements are completed as specified.)
Restoration of the LCO prior to the expiration of the specified time interval of the ACTION statement removes the requirement to complete the ACTION statement.
When an LCO is not met, unless provided for differently in the ACTION statement, within 1 hour ACTION should be initiated to place the facility in a mode in which the requirement does not apply.
Entry into a different mode should not be made unless all of the LCOs are met for that mode, except for the passage through a mode as required to comply with ACTION statements.

1.5.4 SURVEILLANCE REQUIREMENTS

SRs are requirements relating to test, calibration, or inspection to assure that the necessary quality of safety structures, systems and components and their support systems required for safe operations are maintained, that facility operation will be within the SLs, and that the LCSs and the LCOs will be met. Application of SRs is to the following rules in Table 1.5-4.

TABLE 1.5-4
Rules for Application of Surveillance Requirements

SRs must be met for all equipment/components/conditions to be considered OPERABLE.
Each SR shall be performed within the specified interval, with a maximum extension of 25 percent of the interval between any two consecutive surveillances (see Table 1.3-1). Failure to perform a surveillance within the required time interval is considered a TSR VIOLATION (see Table 1.7-1).
Failure to perform a surveillance within the required time interval or failure of a surveillance to meet established criteria shall result in the equipment/component/condition being declared inoperable and the ACTION stipulated for the inoperable equipment/component/condition being taken.
A different mode may not be entered unless all of the SRs for equipment/components/conditions of that mode are current, except for the passage through an OPERATIONAL MODE as required to comply with ACTION statements.

1.6 ALTERNATE EMERGENCY ACTIONS

Emergency actions that depart from the ACTION statements specified in the TSRs may be taken in special circumstances. In an emergency, if a situation develops that is not addressed by the TSRs, staff members are expected to use their training and expertise to take actions to correct or mitigate the situation. Also, staff may take actions that depart from a requirement in the TSRs provided that:

- An emergency situation exists.
- These actions are needed immediately to protect the public health and safety.
- No ACTION consistent with the TSR can provide adequate or equivalent protection.

Such actions shall be approved, as a minimum, by either the RPL Building Manager; or the Manager, Facility Operations; or the RPL Building Emergency Director. If emergency actions are taken, verbal notifications shall be made to RL within 2 hours and by written reports to HQ within 24 hours. (Ref. DOE G 423.1-1, Section 4.4)

1.7 TSR VIOLATION

VIOLATION of a TSR occurs as a result of any of the four circumstances presented in Table 1.7-1 (ref. DOE G 423.1-1, Section 4.11). It is important to note that exceeding a LCS or failing to meet an LCO or a SR, by itself, is not a VIOLATION.

TABLE 1.7-1
Definition of TSR Violation

Exceeding a SAFETY LIMIT
Failure to comply with an ACTION statement following: • exceeding a LIMITING CONTROL SETTING • failure to meet a LIMITING CONDITION FOR OPERATION.
Failure to perform a SURVEILLANCE REQUIREMENT within the required time interval
Failure to comply with an ADMINISTRATIVE CONTROL

1.8 GENERAL PRINCIPLES OF OPERABILITY

GENERAL PRINCIPLE 1: A system is considered OPERABLE as long as there exists assurance that it is capable of performing its specified function(s).

GENERAL PRINCIPLE 2: A system can perform its specified safety function(s) when all of its necessary support systems are capable of performing their related support functions.

GENERAL PRINCIPLE 3: When all systems designed to perform a certain safety function are not capable of performing that safety function, a loss of function condition exists.

GENERAL PRINCIPLE 4: When a system is determined to be incapable of performing its intended safety function(s), the declaration of inoperability should be immediate.

1.9 REFERENCES

National Standards
ANSI/ANS-8.3, *American National Standard Criticality Accident Alarm System*

Regulations
10 CFR 830, *Nuclear Safety Management*

10 CFR 835, *Occupational Radiation Protection*

U.S. Department of Energy Orders, Manuals, Standards, and Guides
DOE O 420.1A, *Facility Safety*

DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*

DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*

DOE G 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*

DOE G 423.1-1, *Implementation Guide for Use in Developing Technical Safety Requirements*

DOE G 424.1-1, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*

(Blank Page)

Section 2 Safety Limits

(Blank Page)

2.0 SAFETY LIMITS

SAFETY LIMITS (SLs) are limits on process variables associated with those safety class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive materials. (Note: There are no process variables that must be controlled to maintain facility operations within the analyses presented in the DSA. Thus, no SLs are required for the RPL.)

(Blank Page)

Section 3/4 Operating Limits and Surveillance Requirements

(Blank Page)

3/4 OPERATING LIMITS AND SURVEILLANCE REQUIREMENTS

This section presents the LCSs, LCOs, and SRs for the RPL. LCSs function to prevent exceeding SLs. No SLs are required for the RPL, consequently there are no LCSs. LCOs establish the lowest functional capability or performance level of safety structures, systems, and components required for safe operations. For the RPL, the LCOs also establish radioactive material inventory limits. Presented below are the LCOs and corresponding SRs for the RPL.

3/4.0 GENERAL APPLICATION

OPERATING LIMITS

3.0.1 LIMITING CONTROL SETTINGS

LCSs are settings on process variable parameters for safety systems that function to prevent exceeding SLs. (Note: There are no SLs for operation of the RPL, therefore there are no LCSs.)

3.0.2 LIMITING CONDITIONS FOR OPERATION

3.0.2.1 Compliance with the LCOs contained in the succeeding requirements is required during the OPERATIONAL MODES or other conditions specified therein; except that upon failure to meet an LCO, the associated ACTION statement shall be met.

3.0.2.2 TSR VIOLATION exists when the requirements of the LCO and associated ACTION statements are not met within the specified time intervals. If the LCO is restored prior to expiration of the specified time intervals, completion of the ACTION statement is not required.

3.0.2.3 When an LCO is not met, except as provided in the associated ACTION statement, within 1 hour ACTION shall be initiated to place the facility in an OPERATIONAL MODE in which the requirement does not apply.

Where corrective measures are completed that permit operation under the ACTION statement, the ACTION may be taken in accordance with the specified time limits as measured from the time of determination that the LCO was not being met. Exceptions are stated in the individual requirements.

3.0.2.4 Entry into an OPERATIONAL MODE or other specified condition shall not be made unless the conditions for the LCO are met without reliance on provisions contained in the ACTION statement. This provision shall not prevent passage through or to OPERATIONAL MODES as required to comply with the ACTION statements. Exceptions are stated in the individual requirements.

SURVEILLANCE REQUIREMENTS

4.0.1 SURVEILLANCE REQUIREMENTS

4.0.1.1 SRs shall be met during the OPERATIONAL MODES or other conditions specified for individual LCSs and LCOs unless otherwise stated in an individual SR for all equipment/conditions to be considered OPERABLE.

4.0.1.2 Each SR shall be performed within the specified time interval, with a maximum extension of 25 percent of the interval between any two consecutive surveillances (see Table 1.3-1).

4.0.1.3 Failure to perform a SR within the specified time interval or failure of a surveillance to meet established criteria shall result in the equipment/condition being declared inoperable and shall be considered a violation of the TSR and a failure to meet a LCO. Exceptions are stated in the individual requirements. When a SR is not performed within its required time frequency, in order to avoid subjecting the facility to unnecessary stand down, additional time may be taken to complete the surveillance before declaring a failed LCO and taking the required ACTION(s). In this case, from the time of discovery, up to 24 hours, or up to the time limit of the specified surveillance frequency (including extension defined in 4.0.1.2), whichever is less is allowed for performing a surveillance test. Surveillances do not have to be performed on inoperable equipment.

4.0.1.4 Entry into an OPERATIONAL MODE or other specified condition shall not be made unless the SR(s) associated with the LCO has been performed within the stated surveillance interval or as otherwise specified.

3/4.1 (Reserved for future use)

OPERATING LIMITS

3.1.1 (Reserved for future use)

3/4.2 RADIOACTIVE MATERIAL

Note: In the application of the LCO requirements and the SRs for radioactive material inventories, the term "within the Room/Area/Facility Limit" is analogous to the term "OPERABLE" used in hardware-related TSRs. Concurrently, the term "exceeds the Room/Area/Facility Limit" is analogous to the term "inoperable" used in hardware-related TSRs. The designation of a ROOM, AREA or FACILITY being inoperable denotes that the only activities that can be performed with the IN-PROCESS inventory are those associated with STANDBY. In STANDBY work with IN-PROCESS radioactive material is restricted to: 1) reduce the potential for an operational accident occurring, including reducing the material inventory; and/or 2) to put IN-PROCESS radioactive material into a safe configuration to reduce consequences should an accident occur.

OPERATING LIMITS

3.2.1 IN-PROCESS ROOM LIMIT

LCO: The IN-PROCESS radioactive material inventory in each ROOM shall not exceed 100 Ci Pu-239E or 50,000 Ci H-3E. The sum of the fractions of these limits shall not exceed 1.0.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

ACTIONS: Upon determination that the IN-PROCESS radioactive material inventory in a ROOM exceeds the ROOM Limit, take the following actions. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. IMMEDIATELY declare the ROOM inoperable.

b. Achieve STANDBY status in that ROOM within **8 hours**.

c. Verify that the IN-PROCESS radioactive material inventory within the affected AREA is within the AREA limit within **8 hours**.

d.1 Restore the IN-PROCESS radioactive material inventory to within the ROOM Limit within **7 days**

Or

d.2 Within **6 days** develop and submit to DOE a plan to restore the IN-PROCESS radioactive material inventory to within the ROOM Limit.

SURVEILLANCE REQUIREMENTS

4.2.1 IN-PROCESS ROOM LIMIT RADIOACTIVE MATERIAL TRACKING

The IN-PROCESS radioactive material inventory in each ROOM shall be demonstrated to be within with the ROOM Limit. (If the required performance specifications of the Surveillance Requirements below are not met, consider the radioactive material inventory in the affected ROOM to exceed the ROOM Limit. If the required verification frequency is not met, up to **24 hours** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least SEMI-ANNUALLY, verify that IN-PROCESS radioactive material inventories are within the ROOM Limit.

OPERATING LIMITS

3.2.2 IN-PROCESS AREA LIMIT

LCO: The IN-PROCESS radioactive material inventory in each AREA shall not exceed 300 Ci Pu-239E or 180,000 Ci H-3E. The sum of the fractions of these limits shall not exceed 1.0.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

ACTIONS: Upon determination that the IN-PROCESS radioactive material inventory in an AREA exceeds the AREA Limit, take the following actions. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. IMMEDIATELY declare the AREA inoperable.

b. Achieve STANDBY status in that AREA within **8 hours**.

c. Verify that the IN-PROCESS radioactive material inventory for the facility does not exceed the Facility Limit within **8 hours**.

d.1 Restore the IN-PROCESS radioactive material inventory to within the AREA Limit within **7 days**

Or

d.2 Within **6 days** develop and submit to DOE a plan to restore the IN-PROCESS radioactive material inventory to within the AREA Limit.

SURVEILLANCE REQUIREMENTS

4.2.2 IN-PROCESS AREA LIMIT RADIOACTIVE MATERIAL TRACKING

The IN-PROCESS radioactive material inventory in each AREA shall be demonstrated to be within the AREA Limit. (If the required performance specifications of the Surveillance Requirements below are not met, consider the radioactive material inventory in the affected AREA to exceed the AREA Limit. If the required verification frequency is not met, up to **24 hours** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least SEMI-ANNUALLY, verify that IN-PROCESS radioactive material inventories are within the AREA Limit.

OPERATING LIMITS

3.2.3 IN-PROCESS FACILITY LIMIT

LCO: The IN-PROCESS radioactive material inventory within the RPL building shall not exceed 1500 Ci Pu-239E or 900,000 Ci H-3E [5 times the AREA limit of 300 Ci Pu-239E or 180,000 Ci H-3E]. The sum of the fractions of these limits shall not exceed 1.0.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

ACTIONS: Upon determination that the IN-PROCESS radioactive material inventory in the facility exceeds the Facility Limit, take the following actions. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. IMMEDIATELY declare the facility inoperable.

b. Achieve STANDBY status in the facility within **8 hours**.

c.1 Restore the IN-PROCESS radioactive material inventory to within the Facility Limit within 7 days.

Or

c.2 Within **6 days** develop and submit to DOE a plan to restore the IN-PROCESS radioactive material inventory to within the Facility Limit.

SURVEILLANCE REQUIREMENTS

4.2.3 NONE

A facility IN-PROCESS radioactive material inventory surveillance is not required in addition to the ROOM and AREA material inventory surveillance's required in 4.2.1 and 4.2.2. If all five AREAs are within limits, the facility is within limits.

OPERATING LIMITS

3.2.4 OUTDOOR CONTAINER LIMIT

LCO: The non-gaseous radioactive material inventory in individual containers for outdoor handling activities, transfer activities, and storage activities shall not exceed 100 Ci Pu-239E.

The gaseous radioactive material inventory in individual containers for outdoor handling activities, transfer activities, and storage activities shall not exceed 30,000 Ci H-3E.

Both material types may be present concurrently. A sum of fractions is not applied to the OUTDOOR CONTAINER material inventory.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

Note: Radioactive material shipments (including gaseous radioactive material, such as tritium) that are contained in certified DOT Type B packages or equivalent are exempt from the limit requirements. This exemption from the limit requirements is limited to shipments or movements of material into, out of, and around the RPL. It is not intended to allow the exemption of radioactive material from external storage limit requirements.

ACTIONS: Upon determination that the radioactive material inventory in a container outside the RPL building exceeds the OUTDOOR CONTAINER Limit, take the following actions. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. Place the affected container in a safe configuration and suspend operations associated with material movement within **4 hours** except those activities necessary to place the container or EAST STORAGE YARD in a safe condition.

b. Develop a Plan of Action for resolving the non-compliant container within **24 hours**.

c.1 Resolve the non-compliant condition within **5 days**.

Or

c.2 Within **4 days** develop and submit to DOE a plan to restore compliance with the OUTDOOR CONTAINER Limit.

SURVEILLANCE REQUIREMENTS

4.2.4 OUTDOOR CONTAINER LIMIT

The radioactive material inventory in each container shall be demonstrated to be within the OUTDOOR CONTAINER Limit. (If the required performance specifications of the Surveillance Requirements below are not met, consider the radioactive material inventory in the affected container to exceed the OUTDOOR CONTAINER Limit. If the required verification frequency is not met, up to **24 hours** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least SEMI-ANNUALLY, verify the radioactive material inventories within containers stored in the EAST STORAGE YARD are within the OUTDOOR CONTAINER Limit.

OPERATING LIMITS

3.2.5 EAST STORAGE YARD LIMIT

LCO: The non-gaseous radioactive material inventory for the EAST STORAGE YARD shall not exceed 100 Ci Pu-239E.

The gaseous radioactive material inventory for the EAST STORAGE YARD shall not exceed 30,000 Ci H-3E.

Both material types may be present concurrently. A sum of fractions is not applied to the EAST STORAGE YARD material inventory.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

ACTIONS: Upon determination that the radioactive material inventory in the EAST STORAGE YARD exceeds the EAST STORAGE YARD Limit, take the following actions. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. Suspend operations within the EAST STORAGE YARD within **4 hours**, except for required inspection and surveillance activities and those activities necessary to place the EAST STORAGE YARD in a safe condition.

b. Develop a Plan of Action for resolving the non-compliant condition within **24 hours**.

c.1 Resolve the non-compliant condition within **5 days**.

Or

c.2 Within **4 days** develop and submit to DOE a plan to restore compliance with the EAST STORAGE YARD Limit.

SURVEILLANCE REQUIREMENTS

4.2.5 EAST STORAGE YARD LIMIT

The radioactive material inventory in the EAST STORAGE YARD shall be demonstrated to be within the EAST STORAGE YARD LIMIT. (If the required performance specifications of the Surveillance Requirements below are not met, consider the radioactive material inventory in the EAST STORAGE YARD to exceed the Limit. If the required verification frequency is not met, up to **24 hours** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least SEMI-ANNUALLY, verify the radioactive material inventories are within the EAST STORAGE YARD Limit.

OPERATING LIMITS

3.2.6 OUTDOOR TRANSFER LIMIT

LCO: Non-gaseous radioactive material IN-TRANSIT outside the RPL shall not exceed 300 Ci Pu-239E. (Limit does not include material in the East Storage Yard)

Gaseous radioactive material IN-TRANSIT outside the RPL shall not exceed 30,000 Ci H-3E.

Both material types may be present concurrently. A sum of fractions is not applied to the IN-TRANSIT material inventory.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

Note: Radioactive material transfers (including gaseous radioactive material, such as tritium) that are contained in certified DOT Type B packages or equivalent are exempt from the limit requirements. This exemption from the limit requirements is limited to transfers of material into, out of, and around the RPL. It is not intended to allow the exemption of radioactive material from external storage limit requirements.

ACTIONS: Upon determination that the radioactive material inventory IN-TRANSIT outside and around the RPL building exceeds the OUTDOOR TRANSFER Limit, take the following action. (Failure to comply with the ACTION statements is a TSR VIOLATION.)

a. Reduce the amount of radioactive material IN-TRANSIT outside the building to below the OUTDOOR TRANSFER LIMIT within **4 hours**.

SURVEILLANCE REQUIREMENTS

4.2.6 OUTDOOR TRANSFER LIMIT

The radioactive material inventory IN-TRANSIT around the outside of the RPL building shall be demonstrated to be within the OUTDOOR TRANSFER Limit. (If the required performance specifications of the Surveillance Requirement below are not met, consider the radioactive material inventory IN-TRANSIT around the outside of the building to exceed the OUTDOOR TRANSFER Limit. If the required verification frequency is not met, up to **7 days** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least SEMI-ANNUALLY, verify the radioactive material inventories transferred around the outside of the RPL in the previous 6 months were within the OUTDOOR TRANSFER Limit.

(Blank Page)

3/4.3 FIRE SUPPRESSION

OPERATING LIMITS

3.3.1 FIRE SUPPRESSION SYSTEMS

LCO: The fire suppression system shall be OPERABLE.

APPLICABILITY: NORMAL OPERATIONS and STANDBY

ACTIONS: Upon determination that a fire suppression system is not OPERABLE:

a. Issue a fire protection outage notice within **1 hour** to establish compensatory measures that reduce the fire risk in the affected area.

AND

b. Perform a walkdown of the affected area within **4 hours** of declaring the fire suppression system inoperable to verify ACTION (a) has been appropriately implemented.

SURVEILLANCE REQUIREMENTS

4.3.1 FIRE SUPPRESSION SYSTEM INSPECTION

The fire suppression system shall be demonstrated OPERABLE. (If the required performance specifications of the Surveillance Requirements are not met, consider the system to be inoperable. If a required verification frequency is not met, up to **24 hours** may be taken to complete the surveillance before declaring the LCO failed and taking the required ACTIONS.)

a. At least MONTHLY, inspect the pressure gauges on the fire suppression system risers to verify indication that water supply is connected to the riser and that system pressure is greater than, or equal to the minimum required for OPERABILITY.

b. At least MONTHLY, inspect water supply control valves to verify the valves are in the required position for OPERABILITY.

c. At least once every 2 years, perform an external inspection of the fire suppression system piping, fittings, and sprinklers.

(Blank Page)

Section 5 Administrative Controls

(Blank Page)

5.0 ADMINISTRATIVE CONTROLS

This section presents the ADMINISTRATIVE CONTROLS (ACs) for the RPL. The ACs relate to organization and management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of the RPL.

5.1 CONTRACTOR ORGANIZATION AND RESPONSIBILITY

The Laboratory shall establish management responsibility and authority for 1) establishing and enforcing policies, procedures, and management systems, and 2) designing the organizational structures to implement Laboratory policies and procedures required for safe operation of the RPL. Required functions include:

a. Management overview of the safety of operations in the RPL.

b. Management approval of revisions to the RPL DSA and TSRs.

c. Independent expert review and approval of revisions to the RPL DSA and TSRs.

d. Support functions for the RPL operations including engineering and project management, waste management, maintenance of the facility and its services, quality assurance, radiological control, occupational safety and health, and environmental compliance.

A manager responsible for overall operation of the RPL within the SAFETY BASIS shall reside in the facility and serve as the principal point of contact for RPL operations. This individual shall delegate in writing the succession to this responsibility during his/her absence. His/Her authorities and responsibilities shall include: stop work authority for activities judged to pose a threat to safe operation, maintenance of the RPL DSA and TSRs, maintenance of a USQ evaluation process, and performance of assessments for maintaining operations within the SAFETY BASIS.

The organizations and positions responsible for meeting the functions of this AC are presented in the DSA. They may be changed without prior DOE approval and will be submitted to DOE in the annual DSA update.

5.2 PROCEDURES

Procedures shall address the following topics:

a. Configuration control process for Facility SSC's

b. Facility maintenance work control

c. Establishing Standby Mode for ROOMS, AREAS, and Facility

d. Functional Testing of Final HEPA Filters

e. Monitoring OPERABILITY of the radioactive exhaust ventilation system (REVS)

f. Recovery procedures for loss of REVS

g. Functional Testing of the Criticality Alarm System (CAS)

h. Faulted Condition Power Supply System Operation

i. Radioactive Material Inventory Management.

5.3 PROGRAMS

Programs required to maintain the RPL SAFETY BASIS are presented below.

5.3.1 RADIOACTIVE MATERIAL EVALUATION PROGRAM

Maintain a radioactive material evaluation program that:

a. Tracks and evaluates radioactive material inventories to verify dose consequences from potential accidents remain bounded by the accident analyses in PNNL-DSA-RPL.

b. Establishes a surveillance program that evaluates facility radioactive material holdup inventories, and changes thereto, so that dose consequences from potential accidents remain bounded by the accident analysis in PNNL-DSA-RPL.

c. Provides and maintains criteria for qualified containers and forms used to exempt radioactive material from inclusion in the accident analyses in PNNL-DSA-RPL.

d. Provides and maintains ROOM, AREA, and EAST STORAGE YARD boundary definitions.

e. Provides and maintains criteria for containers used for outdoor handling, transfer, and storage of radioactive material outdoors and the form factors that may be applied to this material.

5.3.2 RADIATION PROTECTION PROGRAM

Maintain a radiation protection program that:

a. Controls the storage, handling, and use of radioactive material in the RPL.

b. Provides radiation monitoring and control.

c. Provides radiological work controls.

d. Provides radiation safety training.

e. Provides a filtered release pathway for contaminated and potentially contaminated spaces of the RPL through the final stage HEPA filters in the radioactive exhaust ventilation system (REVS).

5.3.3 FIRE PROTECTION PROGRAM

Maintain a fire protection program that:

a. Controls the use of combustible materials in facility design, and the use, handling, and storage of flammable and combustible materials in facility and laboratory operations.

b. Controls ignition sources.

c. Provides automatic fire suppression.

d. Provides fire detection and alarm functions.

e. Provides for manual fire suppression capability.

f. Provides for design review of facility modifications.

g. Provides for inspection, testing, and maintenance of fire protection systems, including controls for system impairments and outages.

h. Provides for periodic fire protection assessments by PNNL fire protection engineers and RPL Building Management, including facility inspections of the use, handling, and storage of flammable and combustible materials.

5.3.4 NUCLEAR CRITICALITY SAFETY PROGRAM

Maintain a nuclear criticality safety program that:

a. Requires DOUBLE-CONTINGENCY PRINCIPLE for facility operations involving FISSIONABLE MATERIAL;

b. Requires a Criticality Alarm System (CAS) in accordance with ANSI/ANS-8.3; defines OPERABILITY requirements for the CAS; and specifies required actions and restrictions when the CAS is degraded or out of service; and

c. Limits FISSIONABLE MATERIAL in storage locations such that an inadvertent criticality in these locations remains incredible when credit is not taken for critically safe storage configurations.

5.3.5 WORKER SAFETY PROGRAM

Maintain a worker safety program that analyzes and controls hazards to the worker. This program shall utilize the PNNL integrated ESH&Q management system, and shall include the following functions:

a. Define the scope of work.

b. Identify and analyze hazards associated with the work.

c. Develop and implement hazard controls.

d. Perform work within controls.

e. Provide feedback on adequacy of controls and continue to improve safety management.

5.4 OPERATING SUPPORT

Maintain a list of support personnel in the PNNL Control Room.

5.5 FACILITY STAFF QUALIFICATIONS AND TRAINING

Maintain a Qualification and Training Program to provide qualified staff for the RPL. This program shall maintain a description of minimum training and qualification requirements for selected RPL Facility Operations staff, support staff, and RPL users.

5.6 TECHNICAL SAFETY REQUIREMENT BASIS CONTROL

Changes may be made to the TSR Bases without prior DOE approval provided the changes do not involve any of the following: (a) a change in the TSR; (b) a change to the DSA that involves an Unreviewed Safety Question as defined in 10 CFR 830; or (c) a change to the way that OPERABILITY or the TSR could be met, applied, or interpreted. Proposed changes that meet any of these criteria shall be reviewed and approved by DOE prior to implementation. Changes to the Basis that may be implemented without prior DOE approval will be provided to DOE at least ANNUALLY.

5.7 REVIEWS AND AUDITS

Maintain an assessment process for RPL to verify facility operations are being maintained within the SAFETY BASIS. Assessments shall include: (a) periodic audits for compliance with the TSRs, (b) USQ evaluations of changes to the facility and its operations with the potential to affect the SAFETY BASIS, and (c) annual review of the DSA.

5.8 REPORTING REQUIREMENTS

In the event an OPERATING LIMIT (LCS or LCO) or a SURVEILLANCE REQUIREMENT is exceeded, or a TSR VIOLATION occurs; make notifications and report the event to DOE. Reporting requirements are contained in DOE M 231.1-2, Occurrence Reporting and Processing of Operations Information, and the Standards Based Management System (SBMS).

Additionally, should a discrepancy between the facility and a TSR be discovered, it must be reported to DOE in accordance with DOE M 231.1-2 and an evaluation must be performed to determine if an Unreviewed Safety Question exists as defined in 10 CFR 830.

Appendix A TSR Bases

(Blank Page)

A-1.0 TSR BASES

This appendix provides summary statements of the reasons for the OPERATING LIMITS and their associated SURVEILLANCE REQUIREMENTS, including the bases for the programmatic ADMINISTRATIVE CONTROLS (Section 5.3). Table A-1 provides a summary of the bases of the TSRs, which were derived from the accident analyses. Detailed discussions of the accidents that form the basis for these limits are available in PNNL-DSA-RPL.

A-2.0 BASIS SUMMARY

The bases for the TSRs as derived from the accident analysis contained in Chapter 7 of the DSA are presented in Table A-1.

A-3.0 BASIS

A-3.1 (Reserved for future use)

TABLE A-1

TSRs Derived from Accident Analyses for RPL Operations

Accident	Controls Needed	TSR
7.2.1 ROOM Fire	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each ROOM to not exceed 100 Ci Pu-39E, or 50,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0. Maintain a radioactive material tracking process.	LCO-3.2.1 AC-5.3.1
	Fire Suppression Systems: Maintain OPERABLE fire suppression systems to minimize the frequency of high consequence fires.	LCO-3.3.1
	Fire Protection: Maintain a fire protection program to limit the extent of this fire to one ROOM.	AC.-5.3.3
7.2.2 AREA Fire	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each AREA to not exceed 300 Ci Pu-239E, or 180,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0. Maintain a radioactive material tracking process.	LCO-3.2.2 AC-5.3.1
	Fire Suppression Systems: Maintain OPERABLE fire suppression systems to minimize the frequency of high consequence fires.	LCO-3.3.1
	Fire Protection: Maintain a fire protection program to limit the extent of this fire.	AC.-5.3.3
7.2.3 CONTAINER Fire	Radioactive Material: Control the radioactive material inventory in each CONTAINER to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO-3.2.4 AC-5.3.1
7.2.4 Multiple CONTAINER Collision/Fire	Radioactive Material: Control the radioactive material inventory in each CONTAINER to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO 3.2.4 AC-5.3.1
	Radioactive Material: Control the radioactive material inventory in the East Storage Yard to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E.	LCO 3.2.5
	Radioactive Material: Control the radioactive material IN-TRANSIT outside the building to not exceed 300 Ci Pu-239E, and not exceed 30,000 Ci H-3E.	LCO 3.2.6
7.3.1 Explosion	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each ROOM to not exceed 100 Ci Pu-239E, or 50,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0. Maintain a radioactive material tracking process.	LCO 3.2.1 AC 5.3.1
7.3.2 Explosion with Building Damage	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each AREA to not exceed 300 Ci Pu-239E, or 180,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0.	LCO 3.2.2 AC-5.3.1

TABLE A-1

TSRs Derived from Accident Analyses for RPL Operations (Continued)

Accident	Controls Needed	TSR
7.3.3 CONTAINER Over Pressurization	Radioactive Material: Control the radioactive material inventory in each CONTAINER to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO 3.2.4 AC 5.3.1
7.4.1 Radioactive Material Spill	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each ROOM to not exceed 100 Ci Pu-239E, or 50,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0. Maintain a radioactive material tracking process.	LCO-3.2.1 AC-5.3.1
7.4.2 Outdoor CONTAINER Handling Event	Radioactive Material: Control the radioactive material inventory in each CONTAINER to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO 3.2.4 AC-5.3.1
7.4.3 Multiple CONTAINER Handling Event	Radioactive Material: Control the radioactive material inventory in each CONTAINER to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process. Radioactive Material: Control the radioactive material inventory in the East Storage Yard to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Radioactive Material: Control the radioactive material IN-TRANSIT outside the building to not exceed 300 Ci Pu-239E, and not exceed 30,000 Ci H-3E.	LCO 3.2.4 AC-5.3.1 LCO 3.2.5 LCO 3.2.6
7.5 Criticality	Criticality Safety: Maintain a nuclear criticality safety program to keep accidental criticality Extremely Unlikely or less frequent.	AC 5.3.4
7.6.2 Anticipated Seismic Event	Radioactive Material: Control the IN-PROCESS radioactive material inventory within the RPL building to not exceed 1500 Ci Pu-239E or 900,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO 3.2.3 AC 5.3.1
7.6.3 Unlikely Seismic Event	Radioactive Material: Control the IN-PROCESS radioactive material inventory in each ROOM to not exceed 100 Ci Pu-39E, or 50,000 Ci H-3E, or the sum of the fractions of these limits to not exceed 1.0. Maintain a radioactive material tracking process. Control the IN-PROCESS radioactive material inventory within the RPL building to not exceed 1500 Ci Pu-239E or 900,000 Ci H-3E. Radioactive Material: Control the radioactive material inventory in the East Storage Yard to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO-3.2.1 LCO 3.2.3 LCO 3.2.5 AC 5.3.1
7.6.4 EU Seismic Event	Radioactive Material: Control the IN-PROCESS radioactive material inventory within the RPL building to not exceed 1500 Ci Pu-239E or 900,000 Ci H-3E. Radioactive Material: Control the radioactive material inventory in the East Storage Yard to not exceed 100 Ci Pu-239E, and not exceed 30,000 Ci H-3E. Maintain a radioactive material tracking process.	LCO 3.2.3 LCO 3.2.5 AC 5.3.1

A-3.2/4.2 Basis for Radioactive Material Limits

A-3.2.1 Basis for Radioactive Material IN-PROCESS ROOM Limit

LCO-3.2.1: Accident scenarios where this LCO is needed to maintain the boundaries of the analyses are listed in Table A-1. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO.

ACTIONS: Prompt (within 8 hours) establishment of STANDBY MODE places the ROOM in a condition that reduces: 1) the potential consequences from accidents because material is placed in a less vulnerable configuration; and 2) the potential for an accident occurring because operations are restricted. The accident analysis identifies both operational and non-operational accidents to be associated with the ROOM inventory. Restoration of the radioactive material inventory to within the LCO may take up to 7 days due to the low frequency of the scenarios requiring this limit. These low frequencies make the overall risk minimal during this recovery period. If it is determined that restoration of the radioactive material inventory to within the LCO may take more than 7 days, then within 6 days a plan to restore compliance with the LCO must be developed and submitted to DOE. The preferred ACTION is to restore the radioactive material inventory to within the LCO within 7 days.

A-4.2.1 Basis for Radioactive Material IN-PROCESS ROOM Limit Surveillance

SR-4.2.1: Semi-annual verification of compliance with the LCO is adequate based on the nature of the RPL operations (i.e., the facility inventory remains relatively constant), and the administrative controls (AC 5.3.1) that are used to manage and evaluate radioactive material allocation and use throughout the building.

A-3.2.2 Basis for Radioactive Material IN-PROCESS AREA Limit

LCO-3.2.2: Accident scenarios where this LCO is needed to maintain the boundaries of the analyses are the ROOM and AREA fires and explosions. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO.

ACTIONS: Prompt (within 8 hours) establishment of STANDBY MODE places the AREA in a condition that reduces the potential consequences from accidents because material is placed in a less vulnerable configuration relative to accidents involving material in an AREA. The accident analysis identifies only non-operational accidents to be associated with the AREA inventory. Restoration of the radioactive material inventory to within the LCO may take up to 7 days due to the low frequency of the scenarios requiring this limit. These low frequencies make the overall risk minimal during this recovery period. If it is determined that restoration of the radioactive material inventory to within the LCO may take more than 7 days, then within 6 days a plan to restore compliance with the LCO must be developed and submitted to DOE. The preferred ACTION is to restore the radioactive material inventory to within the LCO within 7 days.

A-4.2.2 Basis for Radioactive Material IN-PROCESS AREA Limit Surveillance

SR-4.2.2: Semi-annual verification of compliance with the LCO is adequate based on the nature of the RPL operations (i.e., the facility inventory remains relatively constant), and the administrative controls (AC 5.3.1) that are used to manage and evaluate radioactive material allocation and use throughout the building.

A-3.2.3 Basis for Radioactive Material IN-PROCESS Facility Limit

LCO-3.2.3: The accident scenarios where this LCO is needed to maintain the boundaries of the analyses are the seismic events. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO.

ACTIONS: Prompt (within 8 hours) establishment of STANDBY MODE places the FACILITY in a condition that reduces the potential consequences from seismic events because material is placed in a less vulnerable configuration. The accident analysis identifies only seismic events to be associated with the radioactive material inventories in all five AREAs. Restoration of the radioactive material inventory to within the LCO may take up to 7 days due to the low frequency of the scenarios requiring this limit. This low frequency makes the overall risk minimal during this recovery period. If it is determined that restoration of the radioactive material inventory to within the LCO may take more than 7 days, then within 6 days a plan to restore compliance with the LCO must be developed and submitted to DOE. The preferred ACTION is to restore the radioactive material inventory to within the LCO within 7 days.

A-3.2.4 Basis for OUTDOOR CONTAINER Limit

LCO-3.2.4: Accident scenarios where this LCO is needed to maintain the boundaries of the analyses are the accident scenarios associated with outdoor handling activities, transfer activities, and storage activities and are integrated in the accident analysis described in Table A-1. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO. Shipments shipped or received in special shipping casks (DOT Type B Packages or equivalent) are exempt from the limit. A release from handling accidents involving these casks were not considered credible accidents.

ACTIONS: Placing the container in a safe configuration and suspending operations associated with material movement (within 4 hours) reduces the potential for accidents because activities that could initiate an accident are reduced. Restoration of the radioactive material inventory to within the LCO may take up to 5 days due to the low frequency of the scenarios requiring this limit. These low frequencies make the overall risk minimal during this recovery period. If it is determined that restoration of the radioactive material inventory to within the LCO may take more than 5 days, then within 4 days a plan to restore compliance with the LCO must be developed and submitted to DOE. The preferred ACTION is to restore the radioactive material inventory to within the LCO within 5 days.

A-4.2.4 Basis for OUTDOOR CONTAINER Limit Surveillance

SR-4.2.4: Semi-annual verification of compliance with the LCO is adequate based on the nature of the RPL operations (i.e., the facility inventory remains relatively constant), and the administrative controls (AC 5.3.1) that are used to manage and evaluate radioactive material allocation and use throughout the building.

A-3.2.5 Basis for EAST STORAGE YARD Limit

LCO-3.2.5: The accident scenarios where this LCO is needed to maintain the boundaries of the analyses are the accident scenarios associated with outdoor storage activities and are integrated in the accident analysis described in Table A-1. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO.

ACTIONS: The suspension of operations (within 4 hours), with the exception of required inspections and surveillance activities, within the EAST STORAGE YARD reduces the potential of accidents because activities that could initiate an accident are reduced. Restoration of the radioactive material inventory to within the LCO may take up to 5 days due to the low frequency of the scenarios requiring this limit. These low frequencies make the overall risk minimal during this recovery period. If it is determined that restoration of the radioactive material inventory to within the LCO may take more than 5 days, then within 4 days a plan to restore compliance with the LCO must be developed and submitted to DOE. The preferred ACTION is to restore the radioactive material inventory to within the LCO within 5 days.

A-4.2.5 Basis for EAST STORAGE YARD Limit Surveillance

SR-4.2.5: Semi-annual verification of compliance with the LCO is adequate based on the nature of the RPL operations, and the administrative controls (AC 5.3.1) that are used to manage and evaluate radioactive material allocation and use throughout the building.

A-3.2.6 Basis for OUTDOOR TRANSFER Limit

LCO-3.2.6: Accident scenarios where this LCO is needed to maintain the boundaries of the analyses are the accident scenarios associated with outdoor transfer activities, and are integrated in the accident analysis described in Table A-1. These scenarios, presented in detail in PNNL-DSA-RPL, provide the technical basis that must be implemented to meet this LCO. Shipments shipped or received in special shipping casks (DOT Type B Packages or equivalent) are exempt from the limit. A release from handling accidents involving these casks were not considered credible accidents.

ACTIONS: Reducing the amount of radioactive material IN-TRANSIT outside the building to below the OUTDOOR TRANSFER LIMIT (within 4 hours) reduces the potential for accidents because the material-at-risk for an accident is reduced. Reduction of the radioactive material IN-TRANSIT to within the LCO may take up to 4 hours due to the low frequency of the scenarios requiring this limit. These low frequencies make the overall risk minimal during this recovery period.

A-4.2.6 Basis for OUTDOOR TRANSFER Limit Surveillance

SR-4.2.6: Semi-annual verification of compliance with the LCO is adequate based on the low frequency of movement, small amounts of material moved, and the administrative controls (AC 5.3.1) that are used to manage and evaluate radioactive material allocation and use throughout and around the outside of the building.

A-3.3 Basis for Fire Suppression System

LCO-3.3.1: Fire protection is provided by a comprehensive program (TSR AC 5.3.3) that incorporates multiple defense-in-depth barriers to the occurrence and propagation of fires. The fire suppression systems in RPL are not specifically relied on to mitigate dose consequences in the accident analysis, but do perform an important role in conjunction with the other fire protection program elements to minimize the frequency of high consequence fires. Because of the relative importance of the system in providing protection against large fires, a TSR was developed to specify that the fire suppression system be OPERABLE for NORMAL OPERATIONS and STANDY modes.

OPERABILITY for the fire suppression system is the capability to automatically provide fire water flow from the 300 Area water supply main to a fire via the system piping, valves (i.e., PIV and OS&Y control valves, and the alarm check valves), and sprinklers. This capability is established when control valves are in the open position and a minimum static pressure of 75 psi is indicated on the riser supply-side gauges and the system-side gauges for the wet system risers (Risers 1, 2, 3, 4, and 5). The 75 psi pressure is well below normal operating pressures, but greater than the pressure needed to meet calculated flow requirements. Riser 6 is a dry pipe system with air pressure on the system-side and the minimum static pressure doesn't apply. Loss of air pressure in Riser 6 does not cause the system to be inoperable. The fire suppression system consists of that portion of the system downstream of the post indicator valve (PIV) for each riser. The PIVs are not PNNL components, however; they are included in the surveillance requirements for the system because they provide an isolation point for water supply to the riser.

ACTIONS: Outage notices for the fire suppression system communicate to staff the compensatory measures necessary to reduce the risk of fires in the affected area. These compensatory measures may include stopping hot-work (i.e., open flame, welding, cutting, grinding); discontinuing the use of, and properly storing, flammable and combustible liquids and/or flammable gases; and establishing a fire watch. The RPL fire suppression system consists of 6 individual sprinkler systems. The affected area is the area protected by an individual system. Following issuance of the outage notice, a subsequent walkdown will be performed to verify appropriate implementation of compensatory measures.

Appropriate implementation may involve a graded approach to the compensatory measures. The nature of research and development work is such that situations may occur where activities involving hot-work or use of flammable and combustible liquids and/or flammable gases may need to continue because of safety concerns associated with stopping the activity, or unnecessary and significant impacts to research related activities. For these situations, a management and fire protection engineering review will determine what compensatory measures are necessary to allow work to continue.

A-4.3 Basis for Fire Suppression System Surveillance

SR-4.3.1: The pressure gauges located on the individual sprinkler system alarm valves provide indication that the water supply is aligned to the system and the system is ready to respond to a fire. The surveillance frequency is based on National Fire Protection Association (NFPA guidelines).

Visual inspection of the system control valves verifies the valves are open and the system is properly aligned to provide flow upon demand. The surveillance frequency is based on NFPA guidelines.

Biennial visual inspection of the piping, fittings, and sprinklers for indication of leaks or damage provides assurance that the system integrity is maintained and system components will operate as designed. This inspection is based on NFPA 25, "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," and is performed from the floor-level on accessible piping and fittings. The frequency of the inspection is based on NFPA 25 guidelines as modified by an approved equivalency.

A-AC Bases for Programmatic Administrative Controls

Following are the bases for the programmatic ADMINISTRATIVE CONTROLS (Section 5.3). These ACs were derived from the accident analysis as presented in Table A-1 and as discussed in Chapter 7 of the DSA. The remaining, non-programmatic ACs were developed from requirements and guidance provided in DOE G 423.1-1.

Basis for Radioactive Material Evaluation Program

The underlying rational for TSR 5.3.1 is that inventories of radioactive materials in the facility must be controlled to prevent exceeding the Safety Basis. The RPL Radioactive Material Tracking (RMT) process is used to manage the facility's radioactive material inventory including maintaining operations within the Safety Basis (Section 5.2.17 of the DSA). The LCOs establish specific radioactive material limits on inventory bases used in the accident analysis. A supporting process is needed to monitor and evaluate radioactive material inventories on a continuous basis. This process verifies that the LCOs are not exceeded and that other factors related to radioactive material in the facility and the accident analyses (e.g., facility holdup, exempted material, and release factors) are considered.

Part a: A radioactive material inventory management tracking system is needed to maintain the facility inventories within the quantities specified for ROOMs, AREAs, within the RPL building, OUTDOOR CONTAINERS, OUTDOOR MOVEMENT, and the EAST STORAGE YARD within the accident analyses.

Part b: A facility radioactive material holdup surveillance program is needed to verify that the facility maintains holdup inventories at or below the quantities specified within the accident analyses.

Part c: All radioactive material within the RPL building must be accounted for in one of three material classifications; IN-PROCESS, holdup, or exempt. IN-PROCESS and holdup are discussed above in Parts a and b respectfully. "Exempt" material is material located in containers or in forms that maintain integrity for conditions that meet or exceed the accidents listed in Chapter 7 of the DSA. Thus, this material is "exempted" from being included in the material at risk for the RPL Safety Basis. An administrative program that maintains a listing of the containers and forms that meet this criteria is needed to keep the material at risk inventories within the quantities specified for ROOMs, AREAs, and FACILITY within the accident analyses.

The exempt container qualification does not apply to radioactive material handled or stored outside the RPL building.

Part d: The radioactive material evaluation program controls and tracks radioactive material inventories within the facility. By implementing the definitions of ROOM and AREA (as defined in TSR Section 1.1) in the radioactive material evaluation program, the facility radioactive material inventories are maintained within the quantities specified for ROOMs, AREAs, and facility within the accident analyses.

Part e: Radioactive material handled or stored outside the RPL building must be in containers that provide a level of protection from expected upset conditions. An administrative program that maintains a listing of the containers that meet this criteria is needed to verify that the integrity of the containers is within the assumptions of the accident analyses.

- Containers are metal (see *Exemptions in next paragraph) and sealed by mechanical methods (e.g., bolted, latched, locked, or welded). Sealed is defined as complying with manufacturer's requirements for bolting, latching or locking mechanisms. For bolting methods where no manufacturer's information is provided, the bolts shall be greater than finger tight.
- Containers are not stacked more than two high.
- Containers stored in the East Storage Yard do not contain free liquids in the form of flammable/combustible liquids. Incidental quantities of non-flammable/non-combustible free liquids may be present. These are liquids that are impractical to remove via normal pumping or transfer processes. For example, bowling ball casks that are used to transfer and store radioactive liquids are stored in the ESY empty, with the exception of a possible heel.

This listing is not intended to apply to the transfer of radioactive material between facilities that is covered by the radiological control program (e.g., hand carry of samples). Also, form factors are applied to radioactive material in a different form than that assumed in the accident analyses in order to reflect accurate dose consequences. Generally the containers will be sealed metal boxes, drums or other containers (e.g. casks). *Exceptions to this requirement are: (1) combustible containers with only residual contamination approved by a fire protection engineer and facility management, and (2) noncombustible equipment with residual contamination.

Basis for Radiation Protection Program

The underlying rationale for TSR 5.3.2 is that by maintaining a radiation protection program in accordance with 10 CFR 835, the combined protective effects of the multiple elements of the program will adequately:

- protect personnel in the RPL from unnecessary exposure to ionizing radiation
- protect facilities and equipment from excessive contamination with radioactive materials
- promote compliance with applicable regulatory and contractual requirements
- provide a filtered release pathway for contaminated and potentially contaminated spaces of the RPL through the final stage HEPA filters in the radioactive exhaust ventilation system (REVS). This provides an additional layer of protection for the onsite workers and public that is not credited in the DSA accident analysis.

Basis for Fire Protection Program

The underlying rationale for TSR 5.3.3 is that by maintaining a fire protection program in accordance with applicable objectives and criteria established in DOE fire protection directives, the combined protective effects of the multiple program elements will maintain the risk of fires within the RPL SAFETY BASIS and fire hazards analysis. PNNL's fire protection program meets DOE fire protection requirements and thus satisfies the TSR requirement for RPL.

Any changes to the PNNL fire protection program or facility conditions that would significantly diminish the level of protection in RPL as evaluated in the RPL FHA should be evaluated for impact on the accident analysis in Chapter 7.

Basis for Nuclear Criticality Safety Program

The underlying rationale for TSR 5.3.4 is to maintain the frequency assumption for an unplanned criticality event. Specifically, administrative and/or physical controls are developed and implemented to maintain accidental criticality frequency at extremely unlikely or less.

Additional considerations are protection of facility workers and maintenance of the conclusions of the safety class evaluation.

Part a: Administrative and/or physical controls in operational areas must be in place to maintain the accidental criticality frequency at extremely unlikely or less.

Part b: Controls are provided to maintain OPERABILITY of the Criticality Alarm System (CAS) based upon the requirements of DOE 420.1 to address instrumentation that is used to detect inadvertent criticality and to reduce potential risk to facility workers from inadvertent criticality. Additionally, it is expected that:

- Related operating parameters are within limits.
- Necessary attendant instrumentation, controls, electrical power, or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

Part c: The accident analysis in the DSA assumes that criticality is Extremely Unlikely or less frequent. Additionally, the DSA states that no structures, systems, or components (SSCs) need be designated safety class. A criterion for safety class is if the SSC is required to prevent an inadvertent nuclear criticality. Several storage locations in the RPL have design features related to prevention of criticality. However, by applying limitations on facility operations with fissionable material such that credit need not be taken for these design features to maintain criticality incredible, these storage configurations need not be designated and maintained as safety class.

Basis for Worker Safety Program

The underlying rationale for TSR 5.3.5 is that an Integrated Operations program, based on the core functions of integrated safety management, will identify and mitigate hazards related to activities in a specific space in the RPL. Combined with other programs that support worker safety, this program will result in acceptable risk to all workers within the facility.

Proposed changes to the RPL Integrated Operations process that could significantly diminish the level of worker protection in the RPL should be evaluated for impact on maintaining an overall acceptable level of risk to the worker. The intent is to evaluate changes to programs that may have an impact on the overall level of worker safety. For example, significant changes to the Criticality, Fire Protection, or Radiation Protection programs should initiate a USQ review. Other possible changes are modifications to safety-significant SSCs, or significant changes to the IOPS review process.

(Blank Page)

Document Revision History

Document Revision History

Date	Rev. #	Description
9/27/07	2007 Rev. 0	2007 Annual Update • Removed exception statements to LCO 3.2.1 and LCO 3.2.2 to support re-packaging of the Navy heat source. • Reduced LCO 3.2.2 Area H-3E limit to 180,000 Ci and LCO 3.2.3 Facility H-3E limit to 900,000 Ci. • Added an optional ACTION statement to LCOs 3.2.1, 3.2.2, 3.2.3, 3.2.4, and 3.2.5 for development and submittal of a plan to restore radioactive material inventory to within limits prior to expiration of the LCO time limits for inventory exceedance.